Cite No. 9

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 080 609 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
28.08.2002 Bulletin 2002/35

(21) Application number: **99918142.3**

(22) Date of filing: **22.04.1999**

(51) Int Cl.7: **H05B 33/10**, H05B 33/14, H05B 33/22, H05B 41/16, H01L 21/02, H01L 21/203, H01L 31/00

(86) International application number:
PCT/GB99/01233

(87) International publication number:
WO 99/055121 (28.10.1999 Gazette 1999/43)

(54) **ELECTROLUMINESCENT DEVICES**

ELEKTROLUMINESZIERENDE VORRICHTUNG

DISPOSITIFS ELECTROLUMINESCENTS

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **22.04.1998 EP 98303085**
22.04.1998 EP 98303084

(43) Date of publication of application:
07.03.2001 Bulletin 2001/10

(73) Proprietor: **CAMBRIDGE CONSULTANTS LIMITED**
Cambridge CB4 4DW (GB)

(72) Inventors:
- **BARNARDO, Christopher, John, Andrew**
Bishops Stortford Hertfordshire CM23 5NQ (GB)
- **FRYER, Christopher, James, Newton**
Cottenham Cambridgeshire CB4 8SD (GB)
- **DAVIES, Christopher**
Fen Drayton Cambridgeshire CB4 5SL (GB)
- **COX, Paul**
Swavesey Cambridgeshire CB4 5RT (GB)

(74) Representative: **Dixon, Philip Matthew**
Frank B. Dehn & Co.
179 Queen Victoria Street
London EC4V 4EL (GB)

(56) References cited:
DE-A- 2 555 014
US-A- 5 220 249
US-A- 5 334 539

Printed by Jouve 75001 PARIS (FR)

EP 1 080 609 B1

Description

Field of the invention

[0001] The present invention relates to electroluminescent (EL) devices, in particular to electroluminescent displays

Background Art

[0002] Electroluminescence is the emission of light from a substance under electric-field excitation

[0003] Phosphor electroluminescence was discovered and documented in 1936, but it was not until the 1950's that GTE Sylvania received a patent for an EL powder lamp However, the short lifetimes (around 500hrs) of such devices limited their use Work carried out in the 1980's revitalised the powder EL lamp and In 1990 the Durel Corporation demonstrated a flexible EL phosphor device that was incorporated into a LCD flat panel display as a backlight The manufacturing technique involved encapsulating the phosphor powder particles in glass beads and sandwiching the powder, which is held in a dielectric matrix, between two electrodes An AC voltage was applied to the electrodes to stimulate emission. In this way, the thick film phosphor lamp was made a commercial reality

[0004] A typical, known thick-film (or powder) phosphor EL device is shown in Figure 1 and comprises a light emitting material 3 in a dielectric matrix 5, sandwiched between two conducting electrodes 1, 6 The light emitting component (the 'emitter') is phosphor, typically a zinc sulphide (ZnS) powder doped with manganese (Mn). Typically, silver- (Ag), or graphite-loaded screen-printable inks, and indium tin oxide (ITO), which is a transparent conductive material, are used as the electrodes When an AC voltage is applied between the electrodes, the emitter breaks down and conducts current. The current excites the manganese ions, which give off light

[0005] It is known to construct lamps from EL material The benefits of phosphor EL lamps are that they can be made very thin (<0 3mm); they are flat, fully flexible when applied to a flexible plastics substrate; they are rugged, have a wide viewing angle, can be made quite cheaply, can be made in low volumes using simple techniques, and give off very little heat when emitting light Typically, EL lamps are used for backlighting LCD displays (e g watches, mobile phones, etc) and instrument panels

[0006] It is also known to reduce moisture ingression into EL lamps, which would otherwise degrade the ZnS and greatly reduce the service life of the device, by the technique of microencapsulation, where the individual phosphor particles 3 are coated in glass or ITO 4.

[0007] Phosphor EL lamps can be dc-driven by low voltage circuits (1 5-5V) by using inverters and inductors generating AC voltages of, for example, 100 to 300V (peak to peak) at frequencies of 50 to 10,000 Hz These EL devices can generate luminances of 10-100 cd/m^2 Specific lamp/driver arrangements will deliver a lamp half-life of between 3,500 and 10,000 hrs EL lamps are used when an application indicates a need for soft, uniform light emission with a wide viewing angle, operating over a wide temperature range (-40°C to +70°C), with vibration and shock resistance

[0008] In the recent development and commercialisation of the phosphor EL lamp, much effort has been applied to making brighter phosphors which emit more even light and which have extended usable lifetimes In many cases this has led to refinement of the drive strategies to find a match of drive frequency with voltage

[0009] Most recently, the market for EL lamps has increased as they have become more widely available with the declining cost of the components (specifically the ITO coated polyester substrate), and with an increasing awareness of EL lamps amongst industrial designers Their use for LCD backlighting has led to the proliferation of these devices, but newer markets of automotive dashboard lighting and white goods keypad lighting look certain to make the phosphor EL lamp a real mass market component in the future

[0010] Known EL lamps require a transparent conductor through which light is emitted

[0011] Although a range of alternative transparent conductors have been tried (including, transparent conductive polymers and screen printed ITO), at present there appears to be no alternative to the ITO coated substrate This transparent conductor must be coated onto a transparent substrate using a proprietary process and this is an expensive part of the device (accounting for up to 50% of the production cost)

[0012] Apart from expense, there are other problems relating to the use of a transparent electrode coating:

- In order to get fine resolution in a prior art lamp used as a display, areas of the ITO conduction layer must be removed to produce an electrode pattern using either laser oblation or an etching process, further adding to the cost of manufacture.
- The need for a transparent substrate and transparent conductor limits the application possibilities
- The ITO is not a good conductor and therefore requires high current densities to enable such a device to function acceptably
- Using two different processes to create the top and bottom electrodes creates registration difficulties, which become critical when fine resolution devices are manufactured

[0013] The present invention at least in its preferred embodiments aims to provide an EL lamp or display which overcomes at least some of the drawbacks of prior art EL lamps and displays

[0014] The present invention at least in its preferred embodiments further aims to provide an EL lamp or dis-

play which does not require the use of a transparent electrode and which is relatively easy and cheap to produce

[0015] US-A-5 334 539 discloses a method of fabricating polymer-based light-emitting diodes. DE-A-25 55 014 discloses photosensitive arrangements of semiconductor devices.

Summary of the Invention

[0016] Viewed from a first aspect, the present invention provides an electroluminescent illuminating means comprising an electroluminescent substance having at least one surface from which light emission is intended and a plurality of electrodes positioned substantially parallel to the surface(s) of the electroluminescent substance from which light emission is intended so as to cause, in use, an appropriate field of radiation in the electroluminescent substance, wherein at least a portion of at least one of the surfaces of the electroluminescent substance from which light emission is intended is not covered by any of the plurality of electrodes whereby intended light emission does not need to pass through the material of an electrode

[0017] The invention elegantly solves the problem of creating a simpler and cheaper EL lamp or display by obviating the need for expensive transparent conductors such as ITO.

[0018] The invention also eliminates the need for a laminated electrode structure incorporating a transparent conductor as one of the lamina

[0019] The electroluminescent illuminating means may be incorporated in an electroluminescent device such as an EL lamp In a preferred arrangement, however, the electroluminescent illuminating means is incorporated into an electroluminescent display device An electroluminescent display device will generally comprise at least one region, for example a layer, of electroluminescent material arranged between at least one primary electrode and a plurality of secondary electrodes, wherein the secondary electrodes are arranged to be selectively electrically energised to cause selected portions of said electroluminescent material to illuminate, and thereby convey information

[0020] Viewed from a second aspect therefore, the invention provides an electroluminescent display device comprising at least one region of electroluminescent material arranged between at least one primary electrode and a plurality of secondary electrodes, wherein the secondary electrodes are arranged to be selectively electrically energised to cause selected portions of said electroluminescent material to illuminate, and thereby convey information The device preferably comprises electroluminescent material in the form of a powdered phosphor in a dielectric carrier, for example a microencapsulated phosphor, also known as a thick-film EL phosphor

[0021] The primary and/or secondary electrode may be formed on a printed circuit board, for example at the same time as the conductive tracks are applied to the PCB substrate The region of electroluminescent material may also then be formed on the PCB substrate and further electrodes applied as necessary In this way an electroluminescent device may be formed integrally with a printed circuit board in order to achieve a particularly convenient electronically-controlled illumination device or illuminated display, for example

[0022] Viewed from a third aspect therefore the invention provides an electroluminescent device comprising an electroluminescent material arranged between two electrodes wherein at least one of said electrodes is formed as a conductive track on a printed circuit board As explained above, both electrodes may be formed as conductive tracks on a printed circuit board The printed circuit board may comprise additional electronic components for controlling the electroluminescent device This invention extends to a method of making an electroluminescent device as described above

[0023] In a particularly convenient arrangement, the portions of electroluminescent material are arranged in the form of a segmented display, such as a seven segment display

[0024] Segmented displays per se are known Typically, segmented displays are used as alpha-numeric displays where segmented blocks are arranged in arrays so that it is possible to display individual characters with the minimum of addressable areas The seven segment display, shown for example in Figure 4, is an example of such a display which uses a small number of addressable areas and which can be used to display the Arabic numeral set Such seven segment displays are widely used in almost every application where numerical display is necessary

[0025] In the prior art the segments of such a display are made up of light emitting diodes (LEDs) or addressable liquid crystal (LC) areas.

[0026] In the case of LED displays, the display is constructed by positioning and fixing a number of diodes (typically, within a plastic moulding) and connecting them to a controlled power supply, so that each may be lit 9 or unlit 10 (see Figure 4) Alphanumeric characters are displayed by lighting certain patterns of diodes

[0027] In the case of the LC material the segmented areas use the liquid crystal's nematic phase change properties, coupled with a polarising layer, to alter the light transmission quality of a designated area of the display The display is backlit either by reflected incident light, transmitted light or by an artificial light source placed behind the display area Alphanumeric characters are displayed by the contrast between the light and dark areas of the display

[0028] Drawbacks of prior art segmented addresaable displays include:

- LEDs or other lamps are expensive to make
- It is expensive to locate LEDs and other lamps with-

in a plastic moulding

- LEDs do not give high resolution and so limit the size of the characters of an alphanumeric display
- LCDs are expensive because they have sensitive production processes that demand a high level of precision and they require glass substrates This expense means that the production of such displays is only commercially viable at mass production volumes
- LCDs have a narrow viewing angle as a result of their nematic mode of operation.
- LCDs need to be backlit for dark field applications
- LCDs often need to be driven actively Viewed from a fourth aspect, the present invention provides an addressable segmented display which comprises a plurality of phosphor electroluminescent lamps arranged in a predetermined layout

[0029] The invention elegantly solves the problem of creating a segmented addressable display which is cheap to produce and which does not require backlighting

[0030] The invention at least in its preferred embodiments provides a passively driven segmented display which overcomes at least some of the drawbacks of prior art segmented displays

[0031] Thus, the invention provides displays which are far superior in many ways to current segmented displays

[0032] Further objectives and advantages of the invention will become apparent from a consideration of the ensuing description and drawings.

Brief Description of Drawings

[0033] Some embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a schematic representation of a prior art electroluminescent lamp;
Figure 2 is a schematic representation of an electroluminescent lamp according to a first embodiment of the invention;
Figure 3 is a schematic representation of an electroluminescent lamp according to a second embodiment of the invention; and
Figure 4 is a schematic representation of a seven segment display

Detailed description of exemplary embodiments

[0034] Figure 1 shows a typical prior art EL lamp The essential elements of the lamp are electroluminescent particles 3, such as phosphor, which are held between two electrodes 1, 6, one of which is a transparent electrode 6, often referred to as ITO The particles 3 may be encapsulated in glass or ITO beads 4 and held in a dielectric matrix 5. A further layer of dielectric 2 may be provided in order to avoid short circuiting problems and the whole lamp is laid out on a substrate 7 of some sort, typically glass or plastics When an electric field is present between the two electrodes 1, 6, the EL lamp emits light 8

[0035] In the following, phosphor is used as an example of an electroluminescent material. The person skilled in the art will appreciate that many other substances may be used for the same purpose without departing from the invention

[0036] Also, in the following, the invention is described according to two particular embodiments Given the teaching of this document, the person skilled in the art would think of a large number of alternative embodiments which are within the scope of the invention

[0037] In a first embodiment of the invention, instead of creating the electric field between two planar electrodes as in the prior art (see Figure 1), the electric field is generated laterally across a single plane between adjacent electrodes applied to a base substrate (see Figure 2) These adjacent electrodes may, for instance, be interdigitated as shown in Figure 2 or they may be formed in another shape, as determined by the particular application

[0038] Figure 2 shows an electroluminescent illuminating means according to a first embodiment of the invention An electroluminescent substance 9 such as a phosphor (powder film) layer or a phosphor (powder film) layer together with a dielectric sandwich layer lies above a pattern of two electrodes 10, 11 which are interdigitated and which, in turn, lie on a base substrate 12 When appropriate electric signals are applied to the two electrodes 10, 11, the electroluminescent substance emits light 8

[0039] An electroluminescent illuminating means according to the first embodiment of the invention may be produced in either a two or a three stage process:

[0040] In the two stage process, both of the electrodes 10, 11 are created simultaneously on a base substrate 12 in the same operation in a first stage (e g by screen printing, electroplating, sputtering or etch removal of a continuous coating), and in a second stage, the phosphor layer 9 is applied over the electrode pattern (by screen printing or a similar technique)

[0041] In the three stage process, the layer of electrodes and the phosphor layer are separated by a separately applied dielectric layer

[0042] In either case, light created in the phosphor layer is emitted directly from/through the phosphor layer.

[0043] Using either two stage or three stage production methods, when compared to the current manufacturing process, the following benefits are realised:

- The device may be applied to a wide range of substrates (e.g plastic, glass, wood, paper, ceramic etc)
- The device may be applied to the surface of a print-

ed circuit board (PCB) In this case, the surface electrode pattern is created in copper (Cu) at the same time, and by the same etching process that is used to create the surface tracks of the PCB itself The phosphor (or phosphor/dielectric sandwich) is then applied directly to the surface of the PCB.

- There is no need for an ITO layer, reducing the cost of the device and the complexity of structure and manufacture.
- Application of both electrodes at the same time and by the same process makes it possible to manufacture higher resolution devices without registration problems
- More conductive materials can be used for the electrodes (e g copper, silver, gold etc) thus reducing the current densities needed for the acceptable functioning of the device

[0044] In a second embodiment of the invention, instead of creating the electric field between two full area planar electrodes (see Figure 1) and allowing the light to escape through the transparent top electrode 6 the field is generated between two planar electrodes which are formed so as to allow light to escape through gaps created in one (or both) of the electrodes (see Figure 3)

[0045] Figure 3 shows an electroluminescent illuminating means according to a second embodiment of the invention. An electroluminescent substance 9 such as a phosphor (powder film) layer or a phosphor (powder film) layer together with a dielectric sandwich layer lies above a first electrode 14 which lies on a base substrate 12 A second electrode 13 is formed on top of the electroluminescent substance The second electrode 13 does not fully cover the electroluminescent substance 9 and when appropriate electric signals are applied to the two electrodes, the electroluminescent substance 9 emits light 8 'around' the second electrode 13

[0046] An electroluminescent illuminating means according to the second embodiment of the invention may be produced in a four stage process with all the stages using the same production method (i e silk screen printing) Alternatively such an illuminating means may be produced on top of a PCB, where the base electrode is formed from part of the PCB structure itself

[0047] In the four stage process, both the electrodes 13, 14 are silk screen printed using silver or graphite loaded inks, so that they sandwich layers of dielectric and phosphor

[0048] Where the PCB forms the base electrode, the device is created by silk screen printing phosphor, dielectric, and the top electrode 13 directly on to the surface of the electrode area of the PCB.

[0049] Further, the base electrode could be created using a range of different production methods; sputter coating, electro-plating, acid etching, spray coating and offset litho printing, for example

[0050] The top electrode 13 could be applied using a range of different methods; sputtering, electro-plating, spray coating and offset litho printing, for example

[0051] This production method, when compared to the current manufacturing process, realises the following benefits:

- The device may be applied to a wide range of substrates (e g plastic, glass, wood, paper, ceramic etc)
- The device may be applied to the surface of a printed circuit board (PCB) In this case, the surface electrode pattern is created in copper (Cu) at the same time, and by the same etching process that is used to create the surface tracks of the PCB itself The phosphor (or phosphor/dielectric sandwich) is then applied directly to the surface of the PCB
- There is no need for an ITO layer, reducing the cost of the device and the complexity of structure and manufacture
- More conductive materials can be used for the electrodes (e g copper, silver, gold etc) thus reducing the current densities needed for the acceptable functioning of the device

[0052] According to a further embodiment of the invention a segmented addressable display, such as the seven segment example shown in Figure 4, is manufactured from individual phosphor EL lamps arranged in such a way as to form the layout of an addressable segmented display. The phosphor EL lamps may be formed by EL illuminating means as described above

[0053] Such a passive addressable display can be made quickly and cheaply

[0054] The benefits from making an addressable segmented display in this way include:

- The display has all the desirable characteristics of phosphor EL technology, including, for example, ruggedness, flexibility, low cost, vibration resistance, wide choice of colours, thinness (<0 3mm), flexibility, self-illumination and wide viewing angle
- The display can be made with high resolution at low cost.
- The display can be silk screen printed in a number of ways
- The display can be made cheaply and in low or high volumes
- The display can be driven passively

[0055] In summary, according to embodiments of the invention an electroluminescent lamp or display comprises a first electrode 11 on a substrate 12 interdigitated with a second electrode 10 on the same substrate 12. A layer of electroluminescent material 9 is provided over the electrodes 10, 11 The arrangement has the advantage that light 8 from the electroluminescent material does not need to pass through either of the electrodes 10, 11. The substrate 12 may be a printed circuit board In an alternative embodiment the second electrode is

provided over the layer 9 of electroluminescent material and gaps are provided in the electrode for the emission of light The electroluminescent lamps may be used to form a seven segment display

Claims

1. An electroluminescent illuminating means comprising:

   - an electroluminescent substance (9) having at least one surface from which light emission (8) is intended; and
   - a plurality of electrodes (10, 11; 13, 14) positioned substantially parallel to said surface(s) of the electroluminescent substance (9) from which light emission (8) is intended so as to cause, in use, an appropriate field of radiation in the electroluminescent substance (9),

   characterised in that at least one of said surfaces of the electroluminescent substance from which light emission is intended is at least partially not covered by any of the plurality of electrodes (10, 11; 13, 14) whereby intended light emission (8) does not need to pass through the material of an electrode in order for the electroluminescent illuminating means to function as desired.

2. An electroluminescent illuminating means according to claim 1 wherein said plurality of electrodes (10, 11) are applied on a single side of the electroluminescent substance

3. An electroluminescent illuminating means according to claim 2 wherein the single side of the electroluminescent substance on which the plurality of electrodes is attached is opposite to the surface of the electroluminescent substance from which light emission (8) is intended

4. An electroluminescent illuminating means according to either of claims 2 or 3 wherein the electrodes form a pattern in which gaps are left between electrodes whereby light emission occurs due to particular parts of the electroluminescent substance which are in close proximity to said gaps

5. An electroluminescent illuminating means according to any of the preceding claims wherein the electrodes are formed with finger-like projections and neighbouring electrodes are interdigitated

6. An electroluminescent illuminating means according to any of the preceding claims wherein at least one of said plurality of electrodes is formed on the surface of a printed circuit board.

7. An electroluminescent illuminating means according to any of the preceding claims which is mounted on a substrate selected from the group consisting of plastic and glass and wood and paper and ceramic

8. An electroluminescent illuminating means according to any of the preceding claims wherein at least one of said electrodes is formed from a material selected from the group consisting of copper and silver and gold

9. A method of manufacturing an electroluminescent illuminating means comprising the steps of:

   - creating at least one electrode on a substrate; and
   - applying at least one further layer of material on top of said at least one electrode

   wherein at least one of said at least one further layers comprises an electroluminescent substance and wherein any of said at least one further layers of material which constitute a further electrode are created using a conductive, non-transparent material

10. A method of manufacturing an electroluminescent illuminating means according to claim 9 wherein none of the at least one further layers of material constitute a further electrode.

11. A method of manufacturing an electroluminescent illuminating means according to claim 9 wherein at least one of the at least one further layers of material constitutes an electrode which only partially covers the at least one of said at least one further layers comprising an electroluminescent substance.

12. An addressable segmented display which comprises a plurality of phosphor electroluminescent lamps arranged in a predetermined layout.

13. An electroluminescent display device comprising at least one region of electroluminescent material arranged between at least one primary electrode and a plurality of secondary electrodes, wherein the secondary electrodes are arranged to be selectively electrically energised to cause selected portions of said electroluminescent material to illuminate, and thereby convey information

14. An electroluminescent device comprising an electroluminescent material arranged between two electrodes wherein at least one of said electrodes is formed as a conductive track on a printed circuit board

15. A method of making an electroluminescent device, the method including the step of applying an electroluminescent material to a printed circuit board

Patentansprüche

1. Elektrolumineszierendes Leuchtmittel mit:

   - einer elektrolumineszierenden Substanz (9), die wenigstens eine Oberfläche zur Lichtemission (8) aufweist; und
   - zahlreiche Elektroden (10,11;13,14), die im wesentlichen parallel zu der Oberfläche/den Oberflächen zur Lichtemission (8) der elektrolumineszierenden Substanz (9) angeordnet sind, damit bei Benutzung ein geeignetes Strahlungsfeld in der elektrolumineszierenden Substanz (9) erzeugt wird,

   dadurch gekennzeichnet, dass wenigstens eine der Oberflächen der elektrolumineszierenden Substanz zur Lichtemission wenigstens teilweise von keiner der zahlreichen Elektroden (10,11; 14,14) bedeckt ist, so dass die beabsichtigte Lichtemission (8) das Material einer Elektrode nicht passieren muss, damit das elektrolumineszierende Leuchtmittel wie gewünscht funktioniert

2. Elektrolumineszierendes Leuchtmittel gemäß Anspruch 1, wobei die zahlreichen Elektroden (10,11) auf einer einzigen Seite der elektrolumineszierenden Substanz aufgebracht sind.

3. Elektrolumineszierendes Leuchtmittel gemäß Anspruch 2, wobei die einzige Seite der elektrolumineszierenden Substanz, auf der die zahlreichen Elektroden angebracht sind, der Oberfläche der elektrolumineszierenden Substanz, von der die Lichtemission (8) ausgehen soll, gegenüber liegt

4. Elektrolumineszierendes Leuchtmittel gemäß einem der Ansprüche 2 oder 3, wobei die Elektroden ein Muster bilden, bei dem Lücken zwischen den Elektroden freigelassen werden, wobei Lichtemission aufgrund von speziellen Teilen der elektrolumineszierenden Substanz auftritt, die sich in unmittelbarer Nähe der Lücken befinden

5. Elektrolumineszierendes Leuchtmittel gemäß einem der vorhergehenden Ansprüche, wobei die Elektroden fingerartige Vorsprünge aufweisen und benachbarte Elektroden miteinander verzahnt sind

6. Elektrolumineszierendes Leuchtmittel gemäß einem der vorhergehenden Ansprüche, wobei wenigstens eine der zahlreichen Elektroden auf der Oberfläche einer Platine gebildet ist

7. Elektrolumineszierendes Leuchtmittel gemäß einem der vorhergehenden Ansprüche, das auf einem Substrat montiert ist, das ausgewählt ist aus der Gruppe bestehend aus Kunststoff, Glas, Holz, Papier und Keramik

8. Elektrolumineszierendes Leuchtmittel gemäß einem der vorhergehenden Ansprüche, wobei wenigstens eine der Elektroden aus einem Material gebildet ist, das ausgewählt ist aus der Gruppe bestehend aus Kupfer, Silber und Gold

9 Verfahren zur Herstellung eines elektrolumineszierenden Leuchtmittels, wobei das Verfahren folgende Schritte umfasst:

   - Erzeugen wenigstens einer Elektrode auf einem Substrat; und
   - Aufbringen wenigstens einer weiteren Materialschicht auf der Oberseite der wenigstens einen Elektrode,

   wobei wenigstens eine dieser wenigstens einen weiteren Schichten eine elektrolumineszierende Substanz umfasst,
   und wobei diejenigen der wenigstens einen weiteren Materialschichten, die eine weitere Elektrode bilden, unter Verwendung eines leitfähigen, nichttransparenten Materials, gebildet werden

10. Verfahren zur Herstellung eines elektrolumineszierenden Leuchtmittels gemäß Anspruch 9, wobei keine der wenigstens einen weiteren Materialschichten eine weitere Elektrode bildet.

11. Verfahren zur Herstellung eines elektrolumineszierenden Leuchtmittels gemäß Anspruch 9, wobei wenigstens eine der wenigstens einen weiteren Materialschichten eine Elektrode bildet, welche die wenigstens eine der wenigstens einen weiteren Schichten, die eine elektrolumineszierende Substanz umfasst, nur teilweise bedeckt.

12. Adressierbare, segmentierte Anzeige, die zahlreiche elektrolumineszierende Phosphorlampen umfasst, die in einem bestimmten Layout angeordnet sind

13. Elektrolumineszierendes Anzeigevorrichtung, die wenigstens einen Bereich aus elektrolumineszierendem Material umfasst, das zwischen wenigstens einer Primärelektrode und zahlreichen Sekundärelektroden angeordnet ist, wobei die Sekundärelektroden so angeordnet sind, dass sie selektiv elektrisch angeregt werden können, um ein Aufleuchten von bestimmten Abschnitten des elektrolumineszierenden Materials hervorzurufen und dadurch Information zu übertragen

14. Elektrolumineszierende Vorrichtung das ein elektrolumineszierendes Material umfasst, das zwischen zwei Elektroden angeordnet ist, wobei wenigstens eine der Elektroden als Leiterbahn auf einer Platine ausgebildet ist

15. Verfahren zur Herstellung einer elektrolumineszierenden Vorrichtung, wobei das Verfahren den Schritt umfasst, ein elektrolumineszierendes Material auf einer Platine aufzubringen

Revendications

1. Moyens d'éclairage électroluminescents comprenant :

   - une substance électroluminescente (9) ayant au moins une surface à partir de laquelle l'émission de lumière (8) est supposée se faire ; et
   - une pluralité d'électrodes (10, 11 ; 13 ; 14) positionnées de manière sensiblement parallèle par rapport à ladite (auxdites) surface(s) de la substance électroluminescente (9) à partir de laquelle (desquelles) l'émission de lumière (8) est supposée se faire de manière à créer, lors de l'utilisation, un champ de rayonnement approprié dans la substance électroluminescente (9) ;

   caractérisés en ce qu'au moins l'une desdites surfaces de la substance électroluminescente à partir desquelles l'émission de lumière est supposée se faire est au moins partiellement non recouverte par n'importe quelle électrode parmi la pluralité d'électrodes (10, 11 ; 13, 14), moyennant quoi l'émission de lumière souhaitée (8) n'a pas besoin de passer à travers le matériau d'une électrode pour que les moyens d'éclairage électroluminescents fonctionnent comme on le souhaite

2. Moyens d'éclairage électroluminescents selon la revendication 1, dans lesquels ladite pluralité d'électrodes (10, 11) est appliquée sur un seul côté de la substance électroluminescente

3. Moyens d'éclairage électroluminescents selon la revendication 2, dans lesquels le seul côté de la substance électroluminescente sur lequel la pluralité d'électrodes est attachée est opposé à la surface de la substance électroluminescente à partir de laquelle l'émission de lumière (8) est supposée se faire

4. Moyens d'éclairage électroluminescents selon la revendication 2 ou 3, dans lesquels les électrodes forment un motif dans lequel des espaces sont laissés entre les électrodes, moyennant quoi l'émission de lumière se fait en raison de parties particulières de la substance électroluminescente qui sont très proches desdits espaces

5. Moyens d'éclairage électroluminescents selon l'une quelconque des revendications précédentes, dans lesquels les électrodes sont formées avec des saillies en forme de doigts et des électrodes voisines sont interdigitées.

6. Moyens d'éclairage électroluminescents selon l'une quelconque des revendications précédentes, dans lesquels au moins une électrode parmi ladite pluralité d'électrodes est formée sur la surface d'une carte de circuit imprimé

7. Moyens d'éclairage électroluminescents selon l'une quelconque des revendications précédentes, qui sont montés sur un substrat sélectionné parmi le groupe se composant du plastique, du verre, du bois, du papier, et de la céramique

8. Moyens d'éclairage électroluminescents selon l'une quelconque des revendications précédentes, dans lesquels au moins une des électrodes parmi lesdites électrodes est formée à partir d'un matériau sélectionné parmi le groupe se composant du cuivre, de l'argent, et de l'or

9 Procédé de fabrication de moyens d'éclairage électroluminescents comprenant les étapes consistant à :

   - créer au moins une électrode sur un substrat ; et
   - appliquer au moins une couche supplémentaire de matériau sur la partie supérieure de ladite au moins une électrode

   dans lequel au moins une couche parmi ladite au moins une couche supplémentaire comprend une substance électroluminescente et dans lequel n'importe quelle couche parmi ladite au moins une couche supplémentaire de matériau qui constitue une électrode supplémentaire est créée en utilisant un matériau conducteur non transparent

10. Procédé de fabrication de moyens d'éclairage électroluminescents selon la revendication 9, dans lequel aucune de la au moins une couche supplémentaire de matériau ne constitue une électrode supplémentaire

11. Procédé de fabrication de moyens d'éclairage électroluminescents selon la revendication 9, dans lequel au moins une couche parmi ladite au moins une couche supplémentaire de matériau constitue une électrode qui ne recouvre que partiellement la

au moins une couche parmi ladite au moins une couche supplémentaire comprenant une substance électroluminescente.

12. Affichage segmenté adressable qui comprend une pluralité de lampes électroluminescentes luminophores disposées selon une configuration prédéterminée

13. Dispositif d'affichage électroluminescent comprenant au moins une zone de matériau électroluminescent disposée entre au moins une électrode primaire et une pluralité d'électrodes secondaires, dans lequel les électrodes secondaires sont disposées de manière à être excitées électriquement de manière sélective afin d'amener des parties sélectionnées dudit matériau électroluminescent à s'illuminer, et à acheminer ainsi des informations

14. Dispositif électroluminescent comprenant un matériau électroluminescent disposé entre deux électrodes dans lequel au moins l'une desdites électrodes est formée en tant que rail conducteur sur une carte de circuit imprimé

15. Procédé de fabrication d'un dispositif électroluminescent, le procédé comprenant l'étape consistant à appliquer un matériau électroluminescent sur une carte de circuit imprimé

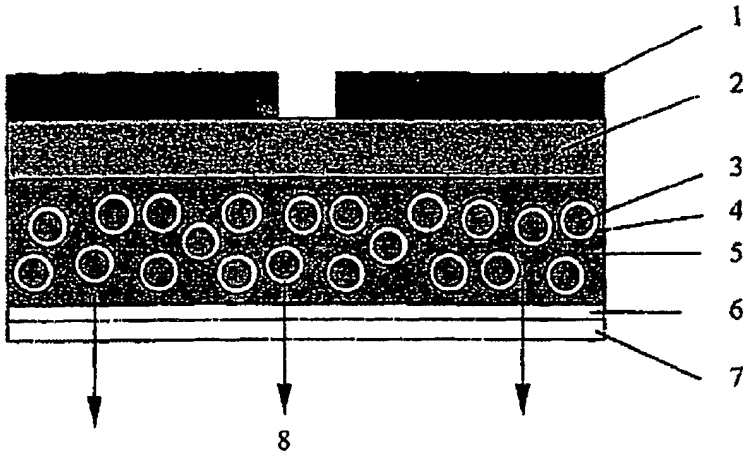

Fig. 1

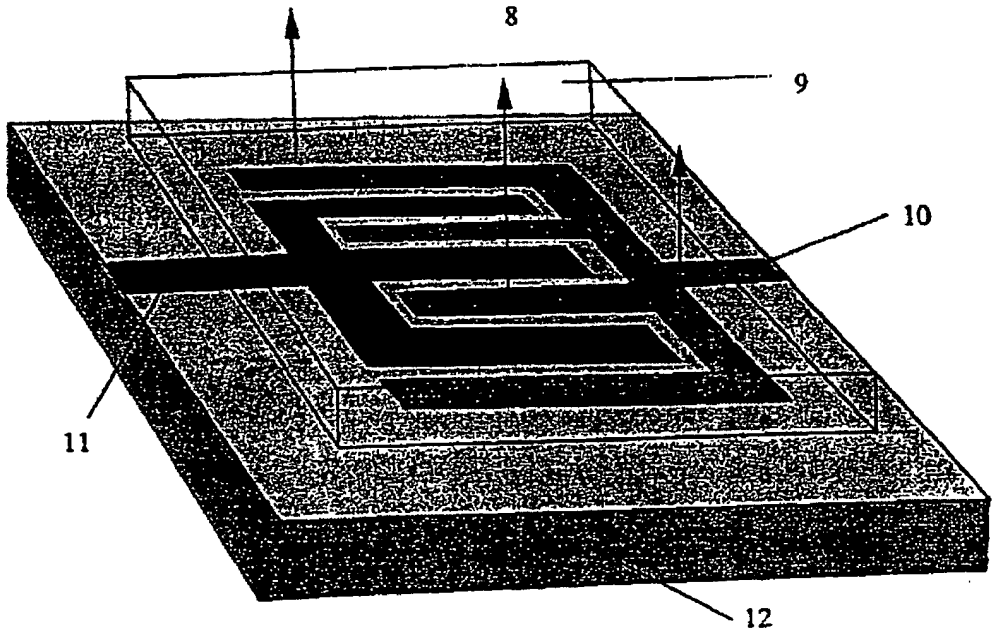

Fig. 2

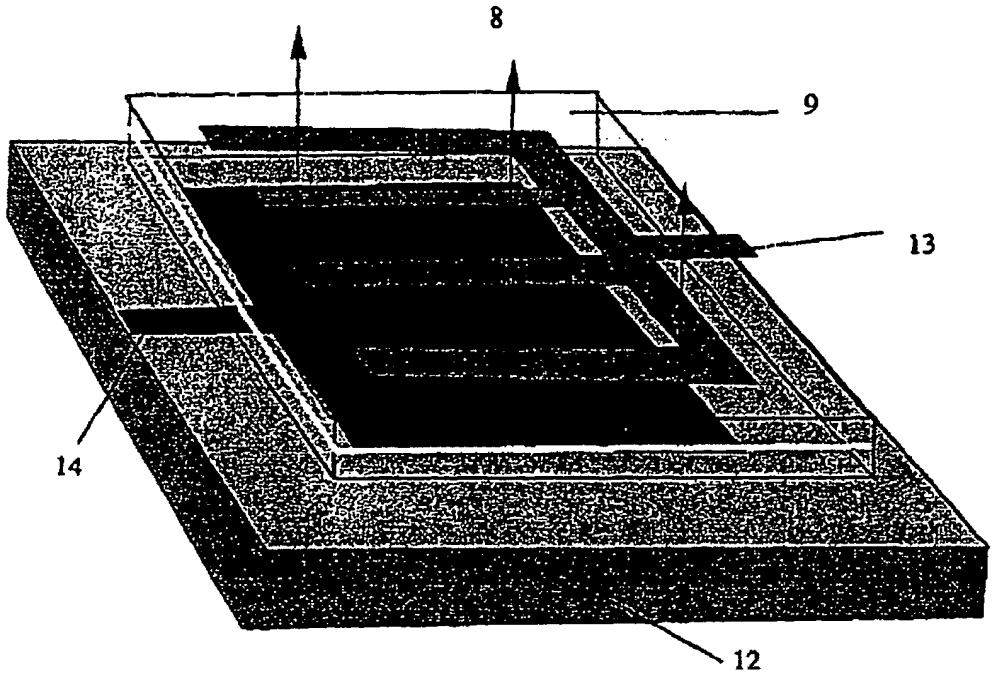

Fig. 3

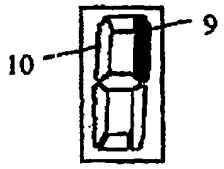

Fig. 4